excurvatis, suturis parum distinctis; testa adolescente costis radiantibus circ. x., subobsoletis, elongatis, arcuatis, sinum versus interruptis, postice nodosis; anfr. ult. sculptura nulla; apertura elongata; canali brevi, aperto; columella recta; labio tenui; labro acuto, suturam versus sinuato, sinu parvo, expanso; operculo normali. Long. 1·1, long. spir. ·65, lat. ·36, div. 27°.

Hab. Sta. Barbara (*Jewett*); S. Pedro (*Cooper*).

386. *Mitromorpha filosa.*

M. testa parva, solidiore, atro-purpurea, subconiformi, antice et postice subæqualiter tereti; anfr. nucl. ii., albis, lævibus, apice mamillato; norm. iv., planatis, suturis haud distinctis; omnino æqualiter spiraliter lirulata; lirulis acutioribus, in spira iv., anfr. ult. circ. xx., interstitiis majoribus; apertura lineata; labro parum inflexo, rotundato, postice vix sinuato, intus circ. xii.-dentato; labio inconspicuo; columella arcuatim truncata. Long. ·26, long. spir. ·1, lat. ·12, div. 45°.

Hab. Sta. Barbara (*Jewett*); Lower California (teste *Trick*, in Mus. Cuming.).

=?*Daphnella filosa*, Brit. Assoc. Rep. 1863, p. 658, note †.

Mr. A. Adams obtained two similar species from Japan; and as the shells do not rank satisfactorily under any established group, he proposes the above genus for their reception. M. Crosse suggests that *Columbella dormitor*, Sby., may be congeneric.

[To be continued.]

XXII.—*On the Classification of* Cerambyces, *with particular regard to the Danish Fauna**. By Professor J. C. Schjödte.

I.

It has perhaps not been observed hitherto that the terms *Digitigrada, Unguligrada,* and *Plantigrada* fully apply to the Arthropoda, or that the manner in which the animals tread the ground and the corresponding structure of their feet deserve special attention as distinctive characters of classes and orders in this series of the animal kingdom; yet it is so. All Arachnida are Digitigrada. All Crustacea (including the Myriapoda, which merely exhibit the Crustacean type modified for terrestrial life) are Unguligrada; and the same is the case with all larvæ of Insects with complete metamorphosis, and with some of the lower groups of Insects, especially Thysanoura and Siphunculata—the unguligrade Arthropoda being at the same time, with few exceptions, also Solipeda. With the exceptions just mentioned, all Insects are Plantigrada.

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* Translated from the 'Naturhistorisk Tidsskrift,' ser. 3. vol. ii. p. 483. Copenhagen, 1864. The original is accompanied with an engraved plate containing details of the organs of the mouth.

It follows that Insects and Arachnida alone can want *foot-pads.* But whilst in Vertebrata the structure of the foot-pads is principally regulated by the weight of the body, the case is different with the Arthropoda, because of their smaller size, firm external skeleton, and enormous muscular power, together with the increased number and different position of their limbs. Here the object of the foot-pads is solely to assist the animal in standing firmly on the ground, and to prevent the foot from slipping in walking. Only those Plantigrade Insects, therefore, have foot-pads whose mode of life requires that they should move on highly inclined dry surfaces; and accordingly the foot-pads consist of innumerable thick hairs, broader, softer, and more or less divided towards their tips, collectively forming an even and almost smooth surface under the foot, soft as velvet, which slopes outwards towards the point of the foot.

Two sets of neighbouring organs, *spurs* and *claws,* facilitate the working of the foot-pads.

The development of *spurs* depends on whether the legs are constructed for *walking* or for *running.* In the first case the limbs are shorter, all three pairs of equal length, and the joints are during the movement inflected against one another in such a manner that femur and tibia form together nearly a right angle, as well as the tibia and tarsus. The position of the tibiæ is therefore perpendicular; and as the movement at the same time is slow, the foot-pads afford sufficient security against slipping, and the spurs are not at all developed, or, at any rate, they remain very small, almost imperceptible. But if the limbs are calculated for running, they are all proportionally longer, the posterior pairs increasing in length; and the joints are, during the movement, so inflected as to form more or less obtuse angles. The longer the legs are, and the greater the difference in length between the different pairs of legs, the more obtuse do the angles become. The position of the tibiæ is consequently sloping outwards; and, the movement being at the same time fast, the foot-pads do not afford sufficient security against slipping; the spurs are therefore developed in proportion as their assistance is needed.

The *claws* play quite a different part. Indispensable as they are for climbing on perpendicular surfaces, and for security against sudden shocks, the claws would essentially impede walking, and render running almost impossible, on account of their downward direction, curved shape, and sharp points, if there had not been added some contrivance in order to suspend their action whenever their service is not required, and to bring them into play, without fail or delay, whenever they are wanted. This contrivance consists in the peculiar position of the claw-joint, its articular insertion being effected on a higher plane than that of the other joints, whereby the animal is enabled, at its option, to raise the claws whilst walking or running, or suddenly to drop them and, as it were, cast anchor. Besides, in order to diminish the weight of the claw-joint when raised up, its point of insertion is removed a little upwards, so as to be actually on the upper surface of the tarsus, the joint which carries it being also cloven, partly in order to enable the animal to bring the foot-pads of that joint to a level with those of the first joints of the tarsus, partly in order to afford space for the movements of the claw-joint.

However, something more is evidently necessary in order to make this mechanism work with perfect ease. Without some further contrivance, the position of the claw-joint, when raised up, would become stiff and straddling; and when turned in different directions, its base would always be exposed to getting foul of the upper parts of the lobes of the cloven joint, between which it lies. The reader may realize the arrangement by keeping the first and second finger extended in such a position that they diverge as much as possible, and then imagining that they represent the two lobes of the cloven joint, and that the long claw-joint, furnished with two moveable claws, is implanted in the middle of the slanting surface in the cleft between the two fingers. It will thus easily be understood that all difficulties and impediments to the necessary freedom and delicacy of the movement may be surmounted by inserting a small new piece between the base of the claw-joint and the point of insertion at the bottom of the cleft between the two lobes. This is in reality the expedient chosen; and the nodule observable at the base of the claw-joint is the real penultimate joint of the tarsus, altered to such a degree in size and shape, for the purpose indicated, that many authors entirely disregard it in counting the joints of the tarsus, and describe the large cloven joint as the penultimate, although it is in reality the third from the end.

That this modification of the penultimate joint in the so-called *pseudo-* or *sub-pentamerous* and *-tetramerous* feet has hitherto been considered enigmatical* is principally owing to the authors creating a difficulty for themselves by supposing erroneously the nodule at the base of the claw-joint to be entirely continuous and forming one piece with the claw-joint itself. Even if it were so, this circumstance would be explicable by the consideration that a sole furnished with foot-pads should not be too long. It is true that this nodule, the true penultimate joint, generally (though not always) remains attached to the claw-joint when this is torn off; and this circumstance no doubt has caused the error of supposing them to form but one joint; but on closer examination a true though not always equally well-developed articulation will nevertheless be found. There are certainly many degrees in the freedom of the articulation, as well as in the size and shape of the penultimate joint; but these will in every case find their full explanation in the particular shape of the cloven joint, the varying depth of the cleft, and the steepness of its sides—a character which has hitherto been so completely overlooked in the numerous and verbose descriptions of species, that I have been able to make the first application of it for the grouping of the species of *Leptura*.

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* One of the most learned and thinking entomologists of the present day, who, besides, has made a special and comprehensive study of the *Chrysomelidæ*, describes the reduction of the penultimate joint as "une particularité dont l'explication est impossible dans l'état actuel de nos connaissances, et qui ne le sera probablement pas moins quand nous aurons pénétré plus avant dans l'organisation de ces insectes.... Il est d'autant plus difficile de se rendre compte d'un caractère commun à un aussi

II.

These observations, which I hope may contribute to a clearer appreciation of the *herbivorous* type of foot in Insects, may at the same time serve as an introduction to the following account (which I have rendered as reliable and complete as I could) of the *Cerambyces* hitherto found on the Danish islands, in North and South Jutland. The *Cerambyces* belong, as is well known, to the innumerable host of Coleoptera, of which the distinctive character, according to the systems now generally followed, lies in their possessing pseudopentamerous tarsi. Although I do not contest the expediency of retaining for the present this systematic definition, I am nevertheless unable to admit that character to be essential, because the peculiarity of structure to which it has reference is, in my opinion, not *typical*, but merely *biological*—dependent on mode of life. It may be sufficient here to remind my readers of the restriction and reduction to which it is subjected whenever, and in proportion as, the animal is less

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grand nombre d'espèces, qu'on n'aperçoit ici aucune relation de cause et d'effet. Il est aisé d'expliquer pourquoi tous les Subpentamères qui se nourissent de feuilles ont des tarses larges et garnis en dessous de poils formant une brosse très-serrée; cette structure leur était nécessaire pour qu'ils pussent s'attacher avec force aux surfaces plus ou moins lisses, sur lesquelles ils se tiennent habituellement. Mais dans le cas dont il s'agit on ne voit pas ce que l'oblitération d'un article des tarses peut avoir de commun avec le régime alimentaire." (Lacordaire, 'Monographie des Coléoptères subpentamères de la famille des Phytophages,' i. pp. 15, 16.)

in want of it—for instance, in those *Curculionidæ* and *Chrysomelidæ* which live under water (*Bagous*, &c., *Hæmonia*): nay, in the case of that remarkable genus of Prionini of which the two sexes have been referred to two different genera, the female (*Acanthinodera Cumingii*, Hope) has naked thorny soles, whilst the soles of the male (*Malloderes microcephalus*, Dup.) are furnished with enormous foot-pads. And the same observation which holds good with regard to the systematic definition of the whole division applies equally to its distribution into families. Just as the term *Pseudopentamera* rather describes vaguely than defines systematically a vast division of the animal kingdom, so the family-characters of *Curculiones*, *Cerambyces*, or *Chrysomelæ*, as now understood, in reality indicate merely the different kinds of plants or parts of plants chosen for the support of their young, whether it be root, stem, branch, twig, bud, leaf, flower, or fruit. Thus the general *habitus* of *Cerambyces* is evidently regulated by the circumstance that the larvæ are to live in the interior of stems and branches; hence their greater size, their powerful build, fit for walking, running, and flying, their long antennæ and large eyes—all peculiarities of structure which enable them to find the timber, or the particular spot in the timber, which has exactly the desirable degree of dryness for their offspring; hence, likewise, the often strongly developed difference between the sexes, rendering it easier for the male to find the female; further, the incomplete development of the two lower pairs of organs of the mouth in those cases where the care for the offspring becomes so absorbing as not to leave time for the adult animal to feed; in short, the *Cerambyces* show all those features of *habitus* which are met with in all other insects which stand in a similar relation to the forest, whatever families or orders they may belong to—as, for instance, *Bombyces* amongst Glossata and *Sirices* amongst Piezata. Nor is there any particular difficulty in explaining the *habitus* of the manifold smaller divisions by similar considerations. No two things could be more congenial than the *habitus* of a *Prionus* and life in the twilight of the forest or in the darkness of night; nothing more natural for the gay *Leptura* than sporting on flowers and sunny shrubs. But to unravel the unknown *type* of which all these hitherto but loosely defined forms are modifications is quite a different problem, for the solution of which far more penetrating studies are required than entomology has hitherto been able to boast of. For the present, my modest endeavour is confined to one family only, that of *Cerambyces*, the classification of which I have tried to place on a new basis in several respects—an attempt which appears called for by the present state of things, inasmuch as it is impossible with any degree of certainty to define the groups by the present vacillating characters of *habitus*; nor do these characters range together all those genera which, by the structure of their essential parts, belong together.

In this respect I have found it necessary to return to that point to which Fabricius carried our systematic knowledge, and to continue where he left off; for it seems to me that his penetrating eye in this matter fixed upon the only true starting-point. Nor did this at first escape Latreille, as indeed might be expected from this excellent systematic author, whose genius, no doubt, was of the highest order, only wanting greater self-reliance. But we cannot wonder that when Latreille, in his forty-ninth year, had finished the stupendous studies of which he has succeeded in condensing the results into the four small octavo volumes of his master-work, 'Genera Insectorum et Crustaceorum,' he did not, in the following years of his life, with equal energy continue these researches, but was content, in his numerous later works, to master the new material as well as it could be done by means of his old treasure of knowledge and experience. This treasure was rich enough to enable him to the last to tower far over the heads of all his contemporaries. But an attentive examination nevertheless shows that the immense accumulation of material which took place in the first decenniums of this century (particularly after South America became more accessible to Europeans) by degrees more and more distended, undermined, and at last entirely destroyed the classification of Latreille's younger days. In the 'Règne Animal' the old structure is hardly to be recognized, half destroyed as it stands there, patched up and extended by numerous slight additions, only incompletely answering their purpose, badly harmonizing with the original simplicity of the structure, obscuring and disfiguring its former noble features. Where much time and labour would have been required in order to treat the new material according to the old method, the more difficult part of the work has been left undone, and new systematic rubrics have been inserted, with far less care than formerly.

It is true that the same may, generally speaking, be said of Fabricius, on comparing those of his works which date from his earlier days with his later publications; but the case is different, because his method, great as the progress was which it involved, nevertheless by its very nature did not allow of extension beyond a certain point without breaking down. The basis and purpose of the Fabrician method was the genus as defined by the organs of the mouth: "Genera tot sunt, quot similiter constructa instrumenta cibaria proferunt diversæ species naturales" (Philos. Ent. Dispos. § 6. 1). He did not doubt the existence of natural groups of genera ("classes"); but maintained, "at nondum tempus est eas elaborare, quum tyrones adhuc scientiæ simus" (*ibid.* § 7. 2); and it is evident that such a method would be superseded at once and belong to the past from the moment that Latreille had started the principle of natural families.

Of course it is now easy enough to see that very much might nevertheless have been done by following up the method which Fabricius had so well established, particularly if he had been able to raise himself to a more physiological view of those important organs on which alone he founded his genera; but surely it would have been almost a miracle if he had been able in his old age to adopt the new method—so entirely at variance with the principles he had hitherto followed—which Savigny shortly after took up with such great success. Fabricius would not surrender his scientific supremacy; and the consequence was that, in order to master the fast accumulating material, he was obliged to extend his genera far beyond their capability—fixed, as they had been, in a one-sided manner—and more and more to weaken the systematic importance of the characters, as may be seen in the 'Systema Eleutheratorum.' Nevertheless it may be said in truth that Fabricius, through his genera founded on the organs of the mouth in connexion with the excellent "adumbrationes," has constructed the classification of *Cerambyces* in all essential points as it now stands; for since then it has hardly received any improvement, save the useful observations on the relations of the coxæ and trochanters which Spinola has communicated in his well-composed treatise on Prionini, but which are by no means so important as he imagined*. The only difference is that, since Latreille began to attach less systematic importance to the structure of the mouth, the study of its organs has been almost entirely neglected, and the long-winded definitions of thousands of species have been founded entirely on those external characters (as the shape and direction of the head, the position of the antennæ compared with the eyes, &c.) which Fabricius had mentioned only as additions to his principal definitions. The consequence is that the classification of this family, as that of so many others, has sunk into such confusion that the difference between the characters of genera and those of species is on the point of becoming effaced and reduced to a mere matter of taste, so that one might make a separate genus of every species —return, in fact, to the ante-Linnæan standing-point—without overstepping the legitimate consequences of the mode of proceeding now prevailing in the classification of *Cerambyces*.

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* Dei Prioniti e dei Coleotteri ad essi più affini Osservazioni del Marchese Massimiliano Spinola (Estr. del vol. v. ser. 2 delle Memorie della R. Accademia delle Sc. di Torino).

III.

The subjoined synoptical table shows what those peculiarities of structure are to which I have drawn attention, as well as what use I have made of them for new characters; and for the better understanding of my ideas I shall here insert a few explanatory remarks, which, however, I am obliged to keep partly in somewhat general terms, in order that they may explain at one and the same time so many and such variously complicated relations, without misguiding as to the details.

It is the different structure of the mouth which regulates the shape and direction of the head, the position of the antennæ, the development of the limbs, the clothing (with hairs, &c.) of the integuments—in short, the whole shape and appearance of the animal. I have here indicated three types of development of the mouth, the peculiarities of which are particularly well indicated by the different development of the third pair of appendages of the mouth—that is, of the stipites of the labial palpi, which either are free and moveable by themselves, or have coalesced with the lingua and thus lost their independent movement, or, finally, have coalesced with each other longitudinally, but not with the lingua, so as to be moveable, but only in unison with each other.

In the *first type*, all parts of the mouth are freely, equally, and harmoniously developed, with the sole view of adapting them for the treatment of pollen, which in that case is the exclusive food of the animal. The mandibles have a vestige of an inner lobe (mala), in the shape of a sharp fold on the under surface, carrying a fringe of setæ. The maxillary lobes are soft, and bordered with a brush of close soft hairs. The lingua is large and thin, divided into lobes clothed with soft close hairs; the fulcrum linguæ is triangular, and does not assume the character of a ligula, as it does not reach the extremity of the lingua; from the surface of the latter arise fringed paraglossæ. In accordance with these peculiarities, the head has an elongated form, the labrum is prominent, covering the organs of the mouth from above; all parts of the animal become elongated, slender, and light, the colour gay, &c.; in short, the whole structure is adapted to a life on flowers. Of course, this combination presents many different gradations; and I have found it difficult to determine what systematic value I should attach to them. After much consideration, I have contented myself with distinguishing between two principal groups, according to whether the mandibles possess a *molar tooth* (mola), properly speaking, or not.

All Cerambyces whose mouth is constructed on the model just described have a small nodule at the base of the mandibles, convex in some, in others (*Clytus*) even a little depressed in the middle, and sometimes covered with a thin felt. But quite different from this is the large, prominent basal protuberance, with a rough upper surface, to which I give the name of a *molar tooth*. Besides, wherever such a molar tooth exists, there is always found inserted behind it a membranaceous lobe, clothed with felt and armed with bristles; and the fringe on the mandibles above mentioned is also placed, not as usually on the fold of the mandibles itself, but on a separate narrow membrane. Mandibles so constructed indicate the highest development of the mouth on this model: all its parts are lengthened, the lingua exceedingly large and thin, and its marginal fringes, as well as those of the maxillary palpi, are crisped at their extremity. The head becomes still longer, and more or less enabled to turn in all directions by the contraction of the neck, the forehead also affording sufficient room for the insertion of the antennæ without blinding (by emargination) any part of the eyes. The prothorax, which in size must correspond to the narrow neck, has not room for the anterior coxæ, which consequently protrude. In short, we have before us the Cerambycine type modified into the elegant *Leptura*.

Second type.—But, whatever be the food of the animal and the corresponding structure of its mouth, there is still one more circumstance which regulates the form of the mandibles, viz. that the animal by their means only is enabled to work its way out of the timber at the end of its metamorphosis. The mandibles therefore are thick and strong, and furnished with a spoon-shaped excavation at their tip, even when the mouth is constructed on the first type, just described. It is, however, evident that if this type is to be preserved, the size and strength of the mandibles cannot be increased beyond certain limits; and we find accordingly that in the case of those *Cerambyces* whose mouth is constructed on that type the pupa is placed tolerably near the bark, so that the perforation of the timber does not require a greater strength or size of the mandibles than is conformable with the preservation of the characteristic features of the type and with the fitness of the mouth for taking food.

It is quite a different type of mouth that we find in the powerful insects constructed for climbing, digging, and flying afar, and designed by nature to attack the giants of the forest. Here the demands upon the perforating power of the mandibles become so overwhelming that there is neither space nor time nor strength left for developing the mouth for any other purpose. The mandibles are increased in size and modified in shape far beyond the limits allowed by the former type, and become clumsy saws, scissors, chisels, or pincers,—all in the service of generation alone, and not at all in the service of nutrition. They monopolize almost the whole bulk of the muscles which the head can accommodate. The other parts of the mouth—labrum, maxillæ, and labium—are often, as it were, merely sketched in their development, or play the part only of pads filling up the space round the bases of the mandibles. The maxillæ often remain undeveloped except the palpi, and all parts and appendages of the labium coalesce. Besides, all these animals are active by night, and the large night-eyes leave hardly room enough on the small forehead for the antennæ, which, as we shall explain more fully hereafter, are endowed with peculiar organs of sensation. This is the type represented by the *Prioni* and those other forms which will be subsequently pointed out as their nearest relatives.

Whilst the two types hitherto described are so far connected that the second may be described as a modification of the first, the *third type*, that of the *Lamiæ*, occupies a more isolated place, approaching more to the Chrysomelini. In this type we find the maxillæ and the labium again fully developed; but their more powerful structure, shortness, and spinulous armature show that they are calculated for a more substantial kind of food than pollen. The mandibles are compressed, flat, entirely destitute of fold, fringe, membranaceous margin, or molar tooth; and although their points are well developed for their special use, viz. the perforation of timber, they never assume the shape of pincers, &c., as met with in the Prionini. The lingua is undivided, or only incompletely divided, and the narrowness of the fulcrum linguæ corresponds with the limited strength demanded for the support of the lingua. The labrum is visible; but, as the whole region behind the mouth (hypostoma) is abbreviated, the forehead becomes perpendicular, as indeed befits animals living, in their larval state, in slender pieces of timber, which the perfect insect has to perforate diametrically. In spite of the length of the face, the space available for antennæ and eyes is therefore but small, and a part of the eyes is accordingly blinded.

Having thus placed the organs of the mouth in the foremost rank, I proceed to notice several other peculiarities of structure which have not been taken into due consideration before, but which I think of high systematic value.

Although it is a well-known and often noticed fact that *Cerambyces* are endowed with *organs of sound*, naturalists have hitherto treated these organs with less attention than they deserve. The well-known creaking sound is produced by rubbing the sharp, downward-bent posterior margin of the pronotum against a circumscribed spot on the mesonotum, which spot shows interferential colours, being covered with extremely close, deep, and minute transverse striæ. At the same time, the fore end of the mesonotum presents a saddle-shaped prolongation, somewhat longer than is required for the purposes of articulation. But all Cerambyces do not possess a creaking apparatus on the mesonotum. There are also mute Cerambyces, viz. all true *Prioni* and some other genera, as *Dorcasomus, Molorchus* (excepting *M. major*, L.), and *Vesperus*; and in this case the mesonotum is punctated and hairy, sometimes smooth and depressed, and the prolongation of its fore end is wanting. Of those genera *Dorcasomus* differs from the Prionini by the structure of its mouth, on account of which it must be ranked among Cerambycini, *Callidium* being its nearest relative. *Molorchus minor*, L., and *M. umbellatus*, L., are closely allied to *Callidium*; whilst *M. major* has the mandibles provided with a molar tooth, and, upon the whole, in all principal points conforms with the group Lepturini. *Vesperus*, which has been classed with the Lepturini by all systematic authors, on account of its contracted neck, nevertheless differs from them in every essential point, and cannot be united to any other group than the Prionini. I have, however, given this remarkable genus a more isolated place in the system, being guided by considerations which I shall next proceed to explain, viz. the structure of its antennæ.

It is principally to Dugès, Erichson, Lespès, and Claparède that we are indebted for studies *of the minute structure of the antennæ* in Insects. I am quite of the opinion of Claparède when this reliable and ingenious anatomist pronounces the peculiar formations on the antennal club of the Cockchafer to be merely hairs singularly modified*; and I would add that anatomists might have arrived at this result much earlier if they had at the outset taken into consideration other less extreme forms than the antennal club of the Cockchafer; for these remarkable forms of hair are far more commonly met with, and there are many more different types of them, than has hitherto been supposed. Amongst Tenebriones, for instance, there is such an abundance of beautiful forms and rich combinations, that the classification of this large family will come into quite a different groove when once these features are taken into due consideration†. With regard to the occurrence of such hairs in Cerambyces, the following remarks may suffice.

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* "Sur les prétendus Organes auditifs des Antennes chez les Coléoptères lamellicornes et autres Insectes" (Ann. des Sc. Nat. 1858, x. p. 243).

† In a great many *Melasomata* (for instance, *Erodius, Pimelia, Trachyderma, Tentyria, Elenophorus, Psammetichus*) the last joints of the antennæ have their apex crowned by an elegant ring of spines surrounding like a fence the tip of the joint, which resembles a cushion covered with

The antennæ of the *Prioni* appear quite bald when examined by the naked eye or by a glass of moderate power; they may be knotty and thorny, but on the very long forms of antennæ not a single hair is to be discovered; and on the short ones (*Parandra, Spondylis*) there are only isolated short stiff bristles, but not the close fine covering of hairs which is observed in other Cerambyces. Besides, the surface, at least of the last joints, is either dull or shows interferential colours all over or on some circumscribed spots, being covered with innumerable minute holes. By a proper preparation (for instance, by boiling a piece of an antenna well for a couple of minutes, and then making delicate longitudinal and transverse sections with a very thin knife), the microscope will show that these holes are cauldron-shaped depressions, carrying at their bottom a very short pellucid hair, whilst for the rest the envelope of the antennæ shows the ordinary structure of the external envelope of Arthropoda, viz. a great many layers of chitine, which from the inside are perforated by the roots of the hairs which had begun to grow out before those layers were formed.

This description of holes, in which the hair at the bottom is invisible except by means of a strong lens, so that the surface appears bald, I propose to name *pores*; they are found on the under surface of the antennæ, from the third to the eleventh joints, grouped in various ways, which will afford an excellent material for the circumscription and definition of genera. These arrangements may, as far as I have hitherto observed, be described as "poriferous spots" or "poriferous depressions, canals, pore-nets," &c. (areæ, foveæ, foveolæ, canaliculæ, &c., poriferæ), and others, of which the following instances may be mentioned:—

SPONDYLIS.—An oblong, somewhat depressed, poriferous spot on each joint.

THAUMASUS.—A small, deep, irregular depression on each joint.

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pores and short hairs. In others of the same family (*Epiphysa, Physosterna, Adesmia, Zopherus, Eurychora, Morica, Akis, Scotobius, Asida,* &c.) the pores are furnished with a short felt, and grouped in sharply circumscribed spots and diamonds on the last joints of the antennæ. In *Scaurus* these joints are entirely covered with large short-haired pores; and analogous though somewhat different arrangements are to be observed in *Nyctobates* and allied genera. *Helops* and many other genera have the last joints quite covered with minute hairs, no pores at all being visible outside. The arrangement in *Diaperis, Uloma,* and other genera with moniliform antennæ, is very remarkable—the ends of the joints, sometimes also their sides, being occupied by pores of enormous size, closely and regularly placed. These few cursory indications may suffice in order to procure for this phenomenon the attention it deserves.

Pœcilosoma.—Many small foveæ on the last joints.

Ctenoscelis.—A small oval fovea at the end of the third, fourth, and fifth joints; the following joints with a couple of foveæ at the apex and one at the base, the foveæ on the last joints by degrees combining into irregular longitudinal canals.

Solenoptera.—A small fovea at the apex of the third joint and those next following; a greater number on the middle joint, and on the last two joints longitudinal rows of pores.

Ægosoma.—A small poriferous spot at the apex of the third joint; a larger one at the apex of the fourth; on the fifth the same, and an additional spot at the base; on the sixth and following joints the spots at the base and apex confluent, the last joints showing a continuous poriferous surface.

Aulacopus.—A group of numerous small spots at the apex of the third joint; on the following ones the number of spots increases, so that the terminal end of the antenna is covered with innumerable oblong spots, as if punctated.

Mallodon.—On the third joint a number of oblong foveolæ, which gradually increase in number and length on the following joints, and finally on the last joints combine with one another so as to form partly irregular grooves, partly a net with long meshes.

Acanthinodera.—A multitude of oblong foveæ on the third and next following joints, increasing in number on the middle joints, the last being entirely covered with narrow poriferous furrows.

Macrotoma.—On the third, fourth, and fifth joints a small poriferous spot at the apex; on the sixth a small spot at the base and a more elongated one at the apex; the seventh the same, but with an additional small spot at the apex; on the eighth the spots at the two extremities begin to unite, and the following joints show two or three long poriferous canals.

Orthosoma.—All the joints entirely occupied by long poriferous grooves.

Naosoma.—Two small spots at the apex of the third joint; on the fourth, two at the base and two others at the apex; on the following joints the spots more or less confluent; the last joints entirely covered with poriferous grooves.

Enoplocerus.—Two small spots separated by a ridge at the apex of the third joint; and on all the following joints two at the base and two at the top.

Ergates.—A small spot at the top of the third joint; on the fourth, one at the base and two (a larger and a smaller one) at the apex; on each of the following joints two at the base and two at the top.

Callipogon.—A small spot near the apex of the third joint; two small ones at the apex of each of the following; on the last joints also very small spots at the base; on the two last of all, two elongated spots.

Parandra.—Each joint with two deep, oval, poriferous foveæ separated by a sharp longitudinal ridge.

Psalidognathus.—A small spot at the apex of the third and fourth joints; on the following, two long deep furrows separated by a ridge.

Anacolus.—Two long poriferous canals on each joint.

Anacanthus.—A rather short spot on the third joint; a longer one on the fourth; on the following, two long furrows separated by a ridge.

Acanthophorus.—Third, fourth, and fifth joints with two spots separated by a ridge, which on the following extend to the whole length of the joints, and on the very last combine to form a continuous poriferous surface.

Prionoenema.—Two spots on each joint, extending their whole length, and deeper in the male; on the last joint a continuous poriferous surface.

Cyrtognathus.—Third to fifth joints flat underneath, quite covered with pores; on the fourth and fifth joints also a small and narrow spot on the anterior surface; on the following a continuous poriferous surface.

Prionus, Tragosoma.—The whole of the antennæ, excepting only the base of the third joint, covered with innumerable small oblong spots with raised intervals, having the effect of a reticulation.

Macrodontia.—The spots innumerable, small, scattered over the whole surface, and so close to each other that the intervals form a net.

Erioderus.—The under surface of the third joint and all the following joints entirely and closely covered with minute pores.

There is a great variation in the size, depth, shape, and relative position of the pores themselves. Upon the whole, they are somewhat more numerous in the males than in the females. The object of the leaf- or tooth-shaped expansion of the joints so often met with is evidently to gain increased room for pores.

In all other Cerambyces the antennæ are covered with hair, as in Insects generally. The hairs of the pores, being also more or less developed, are generally lost in the multitude of ordinary hairs, so that they can be distinguished only by means of the microscope. In some cases, however, they are grouped together in certain places in such a manner that they are perceptible by means of a moderate lens, and may be used for the purposes of classification. In those genera which form my group *Asemini* they are collected in spots, in the manner described below. In many *Cerambycini* they are set in long furrows along the under surface of the joint, as, for instance, in *Callichroma moschata*, whose black antennæ, however, on account of their colour, are less suitable for microscopic inspection than the light-coloured antennæ of several exotic species, for instance of *Trachyderes*. Poriferous grooves are sometimes also observed in the group Lamiini (*Diastocera, Ceroplesis*); but in all those short, clumsy, partially apterous forms living in sand-dunes, steppes, and deserts, which are allied to our *Lamia textor*, the hairs of the pores are, as in this species, collected in depressed spots, as, for instance, in *Zographus, Penthea, Dorcamorphus, Monilema, Phrissoma, Dorcadion,* and *Parmena.* The silky, alternately dark and light covering of the antennæ of many *Cerambyces* is also to be taken into consideration; but for this the microscope is indispensable; and the different forms are not so sharply distinguished as to be of use for classification.

For the definition of genera and species I have made use of several other peculiarities which have not hitherto been taken into proper consideration, but which require no further explanation here.

I propose the name of "flying-hairs" (*pili volatiles*) for the peculiar, long, soft hairs, pointing out from the body, which are found on the antennæ and limbs, sometimes even all over the body, of certain Cerambyces. I consider it probable that their object is to facilitate the flight by giving the animal greater circumference without increasing its weight in the same degree—a view which is confirmed by the circumstance that these hairs only appear in such genera and species as by their structure in other respects seem less adapted for enduring flight. It is possible, however, that in several cases the rows of hairs found on the antennæ have a different object.

IV.

In *Callichroma moschata* the metasternum is unusually large, and shows in each of its posterior angles a small, narrow, spout-shaped slit. Through these apertures a liquid secretion finds its way out, which causes the peculiar strong smell of this *Cerambyx.* The secretion is produced by a pair of large, flat, bilobate glands containing heaps of glandular cells, the ducts from all the cells of each heap being collected into a bundle. Similar apertures are observed on the metasternum of all the numerous and splendid exotic species of *Callichroma,* both from the Old and the New World, and besides in a series of genera from India and South Africa, particularly *Pachyteria, Litopus, Promeces,* and *Polyzonus.* These musk-beetles form a small natural subgroup of their own, united also by other characteristic features, and easily distinguishable by the apertures in question.

The following remarks contain what I have besides to communicate concerning the internal anatomy. It contains the results of numerous dissections of my own at an earlier period, and of a still more considerable series of valuable dissections which Dr. Meinert, at my desire, has executed during the last few summers, and kindly placed at my disposal.

The *tracheæ* are spacious, and their inner membrane, in all larger stems and branches, also in the antennæ and the limbs, closely covered with long and delicate spines.

The *organs of digestion* are differently developed, in close conformity with the different development of the mouth, as above described, particularly with regard to the size of the stomach and the mass of salivary and intestinal glands. The digestive tube is somewhat longer and better equipped with glands in the female than in the male, but always much longer than the body —in the Lamiini as much as four times the length of the body.

The *salivary glands* are tubiform, more or less ramified, in *Leptura* and *Saperda* forming a considerable bundle. They discharge their secretion into the pharynx, at the base of the maxillæ.

The cavity of the mouth has almost disappeared in the *Prioni*, but becomes more capacious in proportion as the lingua is flatter and thinner; there is an abundance of cuticular glands on the ligulæ and maxillæ. The *pharynx* is narrow, with cuticular spines and short setæ, both roof and bottom abundantly supplied with superficial glands. The *æsophagus* is narrow, opening directly into the pear-shaped *crop*, which in the Lepturini only reaches a little way into the prothorax, but in the other groups extends further back, even into the metathorax. The crop possesses externally smooth transverse muscles, and under them striated longitudinal muscles; the inner membrane is spinulose. The *gizzard* is small, with eight indistinct longitudinal folds, mostly covered with cuticular spines. The *stomach* occupies from one eighth (*Prionus*) to five eighths (*Saperda*) of the digestive canal, and runs straight when it is short; when longer, it presents several windings towards its posterior extremity; and when it is very long, as in *Lamia*, it is convoluted and rolled up like a rope; it has the form of a club reversed, is more or less widened at the top, and its musculature is arranged in rectangular squares. The glands of the stomach, in *Prionus* and *Callidium*, are restricted to the walls of this organ, but, in the other Cerambyces, are placed in numerous cæca of different sizes between the meshes of the musculature; these cæca are long and numerous over the whole stomach in the Lepturini, generally decreasing in number and size towards the posterior extremity, where they are sometimes entirely wanting (in most Lamiini); in some few (*Pogonocherus*) the cæca reappear on the end of the stomach. The *intestine* is first bent forward and upward from the end of the stomach, then turned back at a very sharp angle, the remainder being straight; the walls are filled with large glandular cells, the muscular membrane with thick annular muscles. The *rectum* is short and flat, without muscular membrane, but with a pair of long and thin muscles at the base.

There are six long, closely convoluted *Malpighian vessels*, which unite, by degrees or all at once, in front of the sharp bend of the intestine; generally they unite by threes, and then combine into one common tube, which is connected with the intestine by a common membrane surrounding both; inside this the common tube generally divides again into single tubes by threes, which wind themselves, without uniting again, inside the covering membrane and outside the intestine, to the end of the intestine, which thereby becomes club-formed. That part of these vessels which is connected with the intestine differs in structure from that which is outside, and particularly in the extraordinary size of the glandular cells.

There are two (in *Prionus* six) pairs of *testes*, which are brick-shaped, rarely globular (*Callichroma*), consisting of a varying number of generally yellowish or reddish folliculi (6–14, *Exocentrus*; 10–30, *Leptura*; 40, *Clytus, Prionus*; 70–85, *Callichroma*) disposed in the shape of a rosette close round a common circular disk, often free, but in many species of *Leptura* and *Saperda*, and allied genera, in pairs enclosed in thin bags, which also cover part of the *vasa deferentia*. These latter divide themselves into a number of branches corresponding to the number of folliculi, and show sometimes (in *Clytus*) in their posterior part a spindle-shaped expansion. There are one or two pairs of *vesiculæ seminales* (glandular vesicles), which open at the top of the *ductus ejaculatorius*; in most *Lepturæ* only one pair, short and pear-shaped, in a few (*L. quadrifasciata*) two short pairs; in *Rhagium* and *Toxotus* one pair, long and tubular; in Cerambycini and Lamiini two pairs—either one pair pear-shaped and the other tubular and convoluted (*Prionus, Callidium, Exocentrus, Pogonocherus*), or both short and thick (*Liopus*), or both convoluted and tubular, one pair being longer than the other, sometimes united at the base into one common duct (*Cerambyx, Clytus*). In *Callichroma* the arrangement is different: on each side there is a shorter duct divided into several branches, and a longer one divided into a great many branches, which together form a greater bulk than the testes. The *ductus ejaculatorius* is long, the upper end large, more or less club-shaped, often divided into two heads, likewise club-shaped, each receiving a separate vas deferens and a separate pair of vesiculæ seminales. The upper part of the ductus ejaculatorius is free and convoluted; the lower portion is also convoluted, but encased in a thick muscular covering; its lowest division commences rather wider than the rest, is broad and flat, on the outside strengthened by a pair of chitinous plates, and furnished with retracting muscles, whilst the inner surface is spinulose and carries at its extreme end a chitinous fork, in *Cerambyx* also warts, organs of touch. During the act of copulation the fork is fixed in the vulva, and the whole broader part of the ductus ejaculatorius is turned inside out and pushed into the vagina so far that it reaches the bursa copulatrix, whereby the small spines on the inner membrane of the ductus ejaculatorius become turned outside with this membrane, so that they point backwards, and thus serve to keep the male organs in place during copulation. The *penis* is formed by two flat chitinous plates joined above and surrounded by two narrow flaps, which above form a continuous ring, and underneath are joined for a part of their length.

The *ovaries* are divided into numerous ovarian tubes, like the fingers of a hand, the number of the tubes varying from less than ten (*Molorchus, Pogonocherus, Leptura nigra*, 7–9) to nearly fifty (*Leptura testacea*, 40). The eggs are of a very elongated form, often very numerous, of considerable size when mature. The *oviducts* are short, their inner membrane spinulose; the *common oviduct* short. The *bursa copulatrix* appears as a prolongation of the top of the vagina beyond the point of insertion of the common oviduct: it is short in *Leptura* and *Clytus*, of greater length and formed like a bag with a narrow neck in *Rhagium*, tubular in *Lamia*, distended towards the top end in *Cerambyx, Molorchus, Liopus, Exocentrus, Mesosa*. The *spermatheca* rarely round (*Saperda populnea*), club-shaped (*S. carcharias, Mesosa*), or elongated (*Exocentrus*), but generally hook-shaped and somewhat enlarged at the base, with a strong muscle on the concave side; the inner membrane chitinized, brown, or, as in *Saperda carcharias*, black. The *ductus spermathecæ* opens into the vagina at the point where this is joined by the *bursa copulatrix*. The *accessory gland* is inserted on the external side and near the base of the spermatheca; its shape is different in different groups, being short and thick, more or less club-shaped, in Cerambycini and Lepturini, but long, flat, and often ramified in Lamiini; it is exceedingly long in *Lamia, Mesosa*, highly ramified in *Exocentrus*, with more than one hundred ramifications in *Saperda carcharias*. The *ovipositor* is long, slender, and constructed like a telescope; the first joint is formed by the bending inwards of the pieces which cover the cloaca or common vestibule, and possesses near the fore end on each side a glandulous sac producing a lubricatory secretion; the second joint is split on the back, supported by two narrow pieces of chitine ending in a pair of delicately haired palpi. On the piece of chitine which serves as a support for the genitalia, and which is much longer in the females than in the males (reaching in the former sometimes into the very thorax), are inserted four pairs of retracting muscles, viz. one for the vagina, two for the ovipositor, and one for the segments covering the cloaca or common vestibule; the vagina receives a pair of similar muscles from these segments.

There are eight *abdominal ganglia*, the foremost abdominal ganglion being closely joined to the third ganglion of the thorax. The cords uniting the abdominal ganglia are sometimes free and unconnected with one another, sometimes both encased in the same membrane.

V.

The following systematic table is confined to the genera represented in the Danish fauna, but is founded, as the preceding remarks show, on investigations embracing the whole family, as far as the necessary material has been at my disposal. Concerning the leading features of the classification, all that is requisite has already been said, but I shall add a few remarks concerning certain mostly European genera which, according to my view, must find a place in the system different to that they have hitherto occupied. In so doing I refer, amongst the numerous modern books, to the useful work of Mulsant on the French species of Cerambyces, because the classification adopted at present is founded on this work, which may be considered a completion of Latreille's last works.

The exotic genera *Tropidosoma*, *Tragocerus*, *Pœcilopeplus*, *Ceroctenus*, and *Dorcasomus* are to be removed from the group of Prionini to that of Cerambycini. *Spondylis*, which of late has been considered the type of a peculiar group, is to be joined to Prionini. *Rosalia* has free trochanters, and corresponds both in outer shape and in all essential anatomical features to Callidini, from which, however, it is distinguished by a tooth on the back of the mandibles. I suppose that it is owing to merely casual circumstances (as the size and colour, together with its isolated position in the European fauna) that all authors seem to agree in placing it at the side of *Callichroma*, the nearest relatives of *Rosalia* being in reality the American genera *Orthostoma* and *Campocerus*. *Tetropium* (*Criomorphus*) hitherto placed in the group of Callidini, together with *Asemum* and

Criocephalum, hitherto placed in the group of Hesperophani, form a new closely united small group Asemini, which approaches to Prionini. *Hesperophani, Clyti, Obrii,* and *Gracilini* are all to be joined to Cerambycini. *Necydalini* must be dissolved, *Necydalis* joining Lepturini, *Molorchus* Cerambycini, both as types of distinct subtribes. *Stenopterus* is closely allied to Callidini. *Lamiini* find their place at the end of the family, being considered more allied to Chrysomelini than any other Cerambyces; and the genera of *Lamiini* are to be distributed between the principal subgroups in a manner differing from the hitherto adopted division into Lamiæ and Saperdæ. *Vesperus* has to be removed far from Lepturini, and to form a peculiar group of its own between Asemini and Prionini, with which latter it might be united but for the structure of the antennæ. The genera *Rhagium, Toxotus, Pachyta,* and *Leptura* must be defined in a new manner, entailing a redistribution of species. *Rhamnusium* is to be removed to Callidini from Lepturini, where authors have hitherto placed it, misled, no doubt, by its deceptive habitus: it is, in truth, of all Callidini the one most nearly approaching Lepturini.

Amongst the crowd of external characters hitherto used for the classification of the family, but, in my opinion, so floating and so variously combined that they oftener mislead than guide us aright in seeking definite and reliable distinctive characters for systematic divisions, there is one which has done more mischief than any other, viz. the abbreviation and narrowing of the elytra. Just as all natural groups contain genera with different position of antennæ, different shape of hips, and differently developed neck, so most, and perhaps all, groups contain instances of abbreviated or narrow elytra; even amongst *Saperdæ* such may be found, viz. amongst the Indian species and those from tropical Africa (*S. atricornis,* Fabr.). *Necydalini* and *Stenopterus* have been mentioned already. *Odontocera, Rhinotragus,* and *Oregostoma* are, on the contrary, allied to *Clytus,* excepting certain species now ranked among *Oregostoma* (*O. albicans,* Kl., and others), but which really belong to quite distinct subtribes of Cerambycini, seeing that their second pair of coxæ are quite surrounded by the mesosternum and metasternum, and are not reached by the epimera mesothoracica. In this respect the species in question agree with *Ibidiini,* which may be characterized by this peculiarity of their second pair of coxæ and by their round anterior coxæ with obtected trochanters. Among Lamiini the same characters are met with in the American species of *Colobothea,* but not in those of India, which moreover differ by the shoulders of their elytra catching the epimera mesothoracica by means of a process, and by legs of another type.

SYSTEMATIC TABLE OF THE DANISH CERAMBYCES.

I. *Stipites palporum labialium* fixi, basi concreti, linguæ adnati. *Lingua* coriacea vel cornea, brevis, pilosa; ligula et paraglossæ cum lingua confusæ. *Malæ maxillarum* coriaceæ vel corneæ, pilosæ. *Mandibulæ* fimbria et mola carentes. *Trochantini* detecti.

1. *Mesonotum mutum.*

A. *Antennæ poriferæ.*

PRIONINI.

**Antennæ* pilosæ, filiformes, compressæ, areis poriferis magnis, oblongis, concaviusculis, in articulo 3–11mo infra sitis. *Maxillæ* malis binis, minutissimis, coriaceis. *Lingua* biloba. *Pedes* fossorii. *Episterna metathoracica* acuminata. *Prothorax* muticus cordatus.

SPONDYLIS, Fabr.

(*S. buprestoides*, L., rara†.)

** *Antennæ* glabræ, setaceæ, serratæ, areis poriferis numerosis reticulatæ. *Maxillæ* mala interiore nulla, exteriore angusta, porrecta, cornea. *Lingua* truncata. *Pedes* fossorii. *Episterna metathoracica* truncata. *Prothorax* utrinque tridentatus.

PRIONUS, Geoffr.

(*P. coriarius*, L., frequ.)

B. *Antennæ sericatæ.*

VESPERINI.

(Nulli in Dania.)

2. *Mesonotum crepitans.*

C. *Antennæ* pilosæ, areis sensilibus obscuris, in articulo 5–11mo infra sitis. *Pedes* cursorii.

ASEMINI.

**Femora* petiolato-clavata. *Oculi* divisi. *Palpi* securiformes. *Lingua* biloba. *Antennæ* dense verticillato-pilosæ.

TETROPIUM, Kirb.

(*T. luridum*, L., fr.; *T. fuscum*, Fabr., m. fr.)

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† Some of the species here described as rare have hitherto been found only on pine-timber imported from Norway, Sweden, or Germany. However, as a great many species originally thus imported are now common in the Danish pine-forests, no remark has here been made on doubtful cases.

** *Femora* fusiformia, compressa. *Oculi* emarginati. *Palpi* clavati. *Lingua* biloba. *Antennæ* dense pilosæ, in mare infra lanuginosæ.

CRIOCEPHALUM, Dej.

(*C. rusticum*, L., r.; *C. epibata*, Schjödte, r.†)

*** *Femora* fusiformia, compressa. *Oculi* emarginati. *Palpi* clavati. *Lingua* truncata. *Antennæ* brevissime pilosæ.

ASEMUM, Eschsch.

(*A. striatum*, L., fr.)

II. *Stipites palporum labialium* mobiles, discreti, in fulcrum labii retractiles. *Lingua* tenuis, pellucida, biloba, setulosa, lobis barbatis; ligula triangularis, pilosa; paraglossæ angustæ, rectæ, dense barbatæ. *Palpi* articulo ultimo apice truncato, securiformi vel fusiformi. *Mandibulæ* fimbriatæ. *Stipites maxillares* triangulares.

(Epimera mesothoracica coxas attingentia‡.)

1. *Mandibulæ* membrana et mola carentes. *Malæ maxillarum* margine membranaceæ, pilis directis dense barbatæ. *Lingua* lata, lobis divaricatis, barba directa. *Hypostoma* processu mentigero brevissimo.

CERAMBYCINI.

A. *Trochantini* antici obtecti.

a. Prothorax spinosus. Mandibulæ dentatæ, oblongæ.

α. *Glandulæ odoriferæ nullæ. Areæ sensiles antennarum nullæ.*

* *Mala interior maxillarum* brevis, oblique truncata, exterior producta, apice dilatata. *Pronotum* transverse plicatum.

CERAMBYX, L.

(*C. cerdo*, L., fr.)

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† This new species, of which two specimens have been found (supposed to have been imported with foreign timber) may coincide with some of the vaguely described North-American species introduced by Kirby, Randall, and Leconte; or, if European, with *C. polonicum*, Motschoulski, or *C. ferum*, Dej. It differs from *C. rusticum* by its darker colour, much more slender limbs and antennæ, by the antennæ being shorter in proportion to the elytra, and by the hind tarsi being much narrower and longer in proportion to the tibiæ (the proportion being 7 to 11 in *C. rusticum*, but 9 to 11 in *C. epibata*), the third joint of the hind tarsi also being bilobate in *C. rusticum*, but merely emarginate in *C. epibata*. Besides, the large impressed points observable on the elytra of *C. rusticum* are hardly to be perceived in *C. epibata*.

‡ This character distinguishes the following genera from certain forms which are not mentioned, being not represented in the Danish fauna, as *Ibidiini* and the American *Colobotheæ*. (See above.)

β. *Glandulæ odoriferæ orificio arytænoideo in angulo utroque posteriore metasterni. Areæ sensiles antennarum canaliculatæ.*

* *Malæ maxillarum* angustæ, acuminatæ. *Pronotum* tuberculatum.

CALLICHROMA, Latr.

(*C. moschata*, L., fr.)

b. Prothorax inermis. Mandibulæ obscure dentatæ, breviusculæ.

α. *Prothorax globosus.*

* *Palpi* securiformes. *Elytra* integra.

CLYTUS, Fabr.

(*C. liciatus*, L., r.; *C. arcuatus*, L., r.; *C. detritus*, L., rr.; *C. arietis*, L., fr.; *C. mysticus*, L., fr.†)

β. *Prothorax elongatus.*

** *Palpi* maxillares producti, securiformes; labiales articulo ultimo fusiformi.

GRACILIA, Serville.

(*G. minuta*, Fabr., ex Europa meridionali introducta.)

B. *Trochantini* antici detecti.

a. Mesonotum mutum.

* *Elytra* decurtata. *Palpi* articulo ultimo fusiformi. *Antennæ* et *tibiæ* pilis volatilibus. Femora petiolato-clavata.

MOLORCHUS, Fabr.

(*M. dimidiatus*, Fabr., fr.; *M. umbellatarum*, L., r.)

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† The species are thus distributed:—1. Tibiæ without flying-hairs; prothorax, together with the under surface of the body and the thighs, with flying-hairs; the first five joints of the antennæ with a few scattered stiff hairs underneath; prothorax longer than broad, the middle part broadest, the sides steeply arched: ♂, hind thighs reaching the extremity of the elytra; ♀, hind thighs not reaching the extremity of the elytra: (*a*) forehead vaulted, with a broad, sulcated, longitudinal keel; antennæ filiform (*C. liciatus*): (*b*) forehead flatly depressed; antennæ setiform, obscurely dentated (*C. arcuatus, C. detritus*). 2. Fore and middle tibiæ with long flying-hairs on their hind side; head, prothorax, base of elytra, underside of the body and back side of the thighs with long flying-hairs; antennæ thicker at top, the first five joints showing on the under surface a few scattered long bristles; prothorax as broad as long, broadest in the middle; forehead flat (*C. arietis*). 3. All three pairs of tibiæ with long flying-hairs at their hind side; head, prothorax, base of elytra, under side of the body and back side of the thighs with long flying-hairs; antennæ setiform, first seven joints with a few long scattered bristles on their underside; pronotum broader than long, broadest before the middle; forehead flat (*C. mysticus*).

b. Mesonotum crepitans.

* *Femora* petiolato-clavata. *Antennæ* et *tibiæ* pilis volatilibus. *Palpi* securiformes. *Collum* nullum.

CALLIDIUM, Fabr.

(*C. Bajulus*, L., fr.; *C. undatum*, L., r.; *C. Alni*, L., r.; *C. violaceum*, L., m. fr.; *C. sanguineum*, L., r.; *C. variabile*, L., fr.; *C. clavipes*, Fabr., r.†)

** *Femora* fusiformia. *Antennæ* et *tibiæ* inermes. *Palpi* clavati. *Collum* distinctum. (Epimera metathoracica ad coxas decurtata ‡.)

RHAMNUSIUM, Megerle.

(*R. Salicis*, Fabr., rr.)

2. *Mandibulæ* membrana instructæ fimbriata molaque magna, corona planiuscula, apice crispa. *Lingua* ampla, lobis contiguis, margine rotundatis, barba apice crispa. *Hypostoma* utrinque a genis separatum, processu mentigero distincto. *Epimera metathoracica* coxas supertegentia.

LEPTURINI.

a. Mola mandibularum seriatim mucronulata. Elytra integra.

α. Tarsi postici articulis prioribus tribus scopuliferis. Collum obtuse constrictum.

* *Prosternum* crassum, apice tumidum. *Venter* carinatus.

RHAGIUM, Fabr.

(*R. mordax*, Fabr., m. fr.; *R. inquisitor*, L., fr.; *R. indagator*, Fabr., fr.; *R. bifasciatum*, Fabr., m. fr.)

** *Prosternum* angustum. *Venter* carina media nulla.

TOXOTUS, Meg.

(*T. cursor*, L., fr.; *T. meridianus*, L., fr.; *T. 4-maculatus*, L., r.; *T. interrogationis*, L., rr.)

β Tarsi postici articulo tertio scopulifero.

* *Collum* obtuse constrictum. *Oculi* integri.

PACHYTA, Meg.

(*P. collaris*, L., r.)

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† The species are thus grouped:—1. Epimera metathoracica continued beyond the hip; the fore hips distant from each other (*C. Bajulus*, *C. undatum*). 2. Epimera metathoracica not reaching the hind hips: (*a*) the fore hips close to each other; the coxal process of the metathorax sharp (*C. Alni*, *C. violaceum*, *C. sanguineum*, *C. variabile*): (*b*) fore hips separated by a narrow process; the coxal process of the metathorax broad, with an obtuse point; elytra thinly covered with very short close-lying hairs; the flying-hairs of the tibiæ rather short (*C. clavipes*).

‡ This character separates *Rhamnusium* from the first division of *Callidium*. (See preceding note.)

***Collum* acute constrictum. *Oculi* emarginati.

LEPTURA, L.

(*L. livida*, Fabr., m. fr.; *L. ruficornis*, Fabr., fr.; *L. præusta*, Fabr., r.; *L. lævis*, Fabr., fr.; *L. 8-maculata*, Fabr., m. fr.; *L. virens*, L., r.; *L. scutellata*, Fabr., fr.; *L. sanguinolenta*, L., fr.; *L. testacea*, L., fr.; *L. aurulenta*, Fabr., r.; *L. 4-fasciata*, L., fr.; *L. armata*, Herbst (= *L. calcarata*, *L. subspinosa*, and *L. sinuata*, Fabr.), fr.; *L. atra*, Fabr., fr.; *L. nigra*, L., fr.; *L. melanura*, L., fr.; *L. revestita*, L., r.; *L. attenuata*, L., r.†)

b. Mola mandibularum indigeste mucronulata. Elytra decurtata.

* *Tarsi postici* articulo secundo et tertio scopuliferis. *Abdomen* petiolatum. *Collum* acute constrictum.

NECYDALIS, L.

(*N. ichneumonea*, De Geer., rr.)

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† These species are thus grouped:—1. The extremity of the elytra rounded, the deep impressed line along the seam whole and continued round the extremity of the elytra so as to join the marginal line: (*a*) the hind thighs not reaching beyond the end of the abdomen; *a*, third joint of the hind tarsi bilobate; the base of the prothorax with obsolete depressions in the corners, but without a transverse depression across the middle: (*) cheeks as long as clypeus; hind corners of pronotum forming right angles; antennæ thicker towards the top (*L. livida*): (**) the cheeks much shorter than the clypeus; hind corners of pronotum with a short pointed process, turned outwards; antennæ filiform (*L. ruficornis*, *L. præusta*); *β*, apex of third joint of hind tarsi emarginate; cheeks shorter than the clypeus; hind corners of pronotum with a very short pointed process, turned outwards; antennæ thicker towards the tip (*L. lævis*): (*b*) the hind thighs reach some way beyond the apex of the abdomen; cheeks as long as clypeus; third joint of the hind tarsi emarginate; pronotum constricted closely in front of the hind corners, which are furnished with a short, pointed, flat process; antennæ filiform (*L. 8-maculata*). 2. The points of the elytra truncated and emarginate; the linear depression along the seam interrupted at the points; cheeks as long as, or longer than, clypeus: (*a*) hind corners of pronotum forming right angles, without processes; third joint of hind tarsi deeply emarginate (*L. virens*): (*b*) pronotum contracted closely in front of the hind corners, which show a short blunt process; ♂, antennæ obsoletely dentated from 5th to 10th joint; last abdominal joint bidentate; ♀, last joint of abdomen emarginate, and third joint of hind tarsi bilobate (*L. scutellata*); *β*, third joint of hind tarsi deeply emarginate (*L. sanguinolenta*, *L. testacea*): (*c*) hind corners of pronotum with long pointed processes corresponding in shape to the shoulders of the elytra; third joint of hind tarsi emarginate, and pronotum with a deep transverse impression in front of the base (*L. aurulenta*, *L. 4-fasciata*, *L. armata*, *L. atra*); *β*, pronotum without any transverse impression, but with a slight depression in each hind corner (*L. nigra*, *L. melanura*, *L. revestita*, *L. attenuata*).

III. *Stipites palporum labialium* fixi, toti concreti, in apice fulcri prominentes. *Lingua* coriacea vel cornea, cordata, spinulosa; ligula acuminata, setosa; paraglossæ confusæ cum lingua. *Malæ maxillarum* spinulosæ, exterior angusta, cornea. *Mandibulæ* fimbria et mola carentes. *Palpi* filiformes, articulo ultimo acuminato. *Stipites maxillares* quadrati, margine exteriore repando. *Tibiæ* anticæ intra oblique canaliculatæ. *Calcaria* brevissima.

LAMIINI.

1. *Coxæ* anticæ globosæ; trochantinis obtectis. *Femora* petiolata, clavata. *Prothorax* spinosus. *Tibiæ* intermediæ tuberculatæ. *Antennæ* annulatæ.

A. *Pedes* inæquales, sensim crescentes. *Tarsi* postici articulo primo longiore quam secundo.

a. Coxæ anticæ distantes. Frons planiuscula.

α. Tarsi postici articulo tertio scopulifero. Antennæ inermes.

* *Antennæ* longissimæ. *Lingua* profunde incisa.

ASTYNOMUS, Dej.

(*A. ædilis*, L., m. fr.; *A. griseus*, Fabr., r.; *A. costatus*, Fabr., r.)

** *Antennæ* productæ. *Lingua* emarginata.

LIOPUS, Serv.

(*L. nebulosus*, L., fr.)

β. Tarsi postici articulis prioribus tribus scopuliferis.

* *Antennæ* pilis volatilibus. *Lingua* profunde incisa. *Elytra* apice truncata.

ACANTHODERES, Serv.

(*A. varius*, Fabr., r.)

b. Coxæ anticæ contiguæ.

* *Frons* convexa. *Palpi* maxillares articulo ultimo attenuato. *Antennæ* pilis volatilibus. *Lingua* emarginata.

EXOCENTRUS, Meg.

(*E. balteus*, L., m. fr.)

B. *Pedes* æquales. *Tarsi* postici articulo primo et secundo æqualibus.

* *Coxæ anticæ* distantes. *Antennæ* pilis volatilibus. *Frons* planiuscula. *Lingua* vix emarginata. *Palpi* articulo ultimo attenuato.

POGONOCHERUS, Meg.

(*P. fasciculatus*, Fabr., r.; *P. hispidus*, Fabr., m. fr.; *P. pilosus*, Fabr., fr.)

2. *Coxæ* anticæ conicæ, trochantinis detectis.

A. *Prothorax* spinosus. *Tibiæ* intermediæ tuberculatæ.

a. Antennæ inermes. Femora fusiformia.

* *Antennæ* crassæ, corpore breviores, foveolatæ, sericatæ, infra arearum sensilium duplici serie impressæ. *Lingua* cornea, crassa, truncata. *Frons* convexiuscula. *Tibiæ* posticæ crassæ, tuberculatæ.

LAMIA, Fabr.

(*L. textor*, L., fr.)

** *Antennæ* productæ, infra arearum sensilium duplici serie impressæ, maris granulosæ, fœminæ sericeo-annulatæ. *Lingua* apice retusa, laciniis acutis. *Frons* planiuscula. *Tibiæ* posticæ crassæ, apice tomentosæ.

MONOCHAMUS, Latr.

(*M. sutor*, L., r.; *M. sartor*, Fabr., r.)

b. Antennæ pilis volatilibus.

* *Femora* petiolato-clavata. *Lingua* emarginata.

LEPARGUS, Schjödte.

(*L. fennicus*, Payk., r.)

B. *Prothorax* inermis. *Femora* fusiformia. *Antennis* pilis volatilibus.

a. Pedes æquales. Antennæ setaceæ, annulatæ. Lingua subemarginata.

* *Antennæ* undecim-articulatæ. *Tarsi* dimidiæ tibiarum longitudinis. *Tibiæ* intermediæ rectæ. *Mandibulæ* apice integræ. *Palpi* maxillares articulo ultimo duplo longiore quam tertio. *Coleoptera* tomentosa, apice late rotundata.

MESOSA, Meg.

(*M. nubila*, L. (Gmelin), r.)

** *Antennæ* duodecim-articulatæ. *Tarsi* longitudine tibiarum. *Tibiæ* intermediæ sinuatæ. *Mandibulæ* apice fissæ. *Palpi* maxillares articulo ultimo sesqui longiore quam tertio. *Elytra* fasciculato-pilosa, apice acute rotundata.

AGAPANTHIA, Serv.

(*A. angusticollis*, Gyllh., fr.)

b. Pedes inæquales, sensim crescentes. Mandibulæ apice integræ.

α. Antennæ setaceæ, annulatæ.

* *Unguiculi* integri. *Tibiæ* intermediæ obscure sinuatæ. *Coxæ* anticæ distantes.

SAPERDA, Fabr.

(*S. carcharias*, L., fr.; *S. populnea*, L., fr.; *S. scalaris*, L., r.; *S. Tremulæ*, Fabr., r.)

β. Antennæ filiformes. Unguiculi dentati. Tibiæ intermediæ sinuatæ. Coxæ anticæ appropinquantes.

† Antennæ tomentosæ.

* *Elytra* apice truncato-rotundata. *Frons* convexa. *Oculi* divisi.

TETROPS, Kirb.

(*T. præusta,* L., fr.)

†† Antennæ sericatæ.

* *Elytra* apice acuminata. *Frons* planiuscula. *Tibiæ* intermediæ incurvæ.

STENOSTOLA, Dej.

(*S. nigripes,* Fabr., fr.)

** *Elytra* apice truncato-emarginata. *Frons* convexa. *Scutellum* truncatum, brevissimum. *Tarsi* dimidiæ tibiarum longitudinis. *Abdomen* thorace cum capite longius.

OBEREA, Meg.

(*O. linearis,* L., r.)

*** *Elytra* apice truncato-emarginata. *Frons* convexa. *Scutellum* triangulum. *Tarsi* tibiis tertia parte breviores. *Abdomen* longitudine thoracis.

PHYTŒCIA, Dej.

(*P. cylindrica,* L., fr.)

XXIII.—*Description of a new Characinoid Genus of Fish from West Africa.* By Dr. ALBERT GÜNTHER.

[Plate V.]

A SMALL collection of reptiles and fishes from the western coast of Africa, just procured for the British Museum, contains a single example of a Characinoid form which is of great interest, inasmuch as it is allied to *Ichthyborus**, a genus from the Nile, which, till very recently, was scarcely known. It differs so materially from the East-African form, that it must be referred to a separate genus, which I name

PHAGO.

In general appearance strikingly similar to *Spinachia.* Dorsal

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* Kner does not appear to have been aware that these fish were known already to Joannis, and that I had founded a genus for them, when he published his genus *Psalidostoma,* which is evidently identical with *Ichthyborus. Psalidostoma caudimaculatum,* Kner, is probably synonymous with *Ichthyborus microlepis,* Gthr.